ON A CASE OF SPLENECTOMY FOR LEUKÆMIC ENLARGEMENT.

By THEODORE A. McGRAW, M.D.,

OF DETROIT, MICHIGAN,

PROFESSOR OF SURGERY IN THE DETROIT MEDICAL COLLEGE.

ENCOURAGED by Dr. Richardson's case of a leukæmic spleen, I ventured last summer to operate on a similar case in the person of a child eight years of age. I was not fortunate in the result, but the case, nevertheless, presents some interesting features which make its publication seem desirable.

J. I., aged eight years, was brought to me by his father on June 3, 1901. I could not get a very satisfactory history of his case, but as far as obtained it was as follows: He had begun to show symptoms of ill health nearly two years before I saw him. He had suffered but little pain, but had had frequent attacks of chills and fever, for which he had taken large doses of quinine. He still had these paroxysms at intervals of about two weeks' duration. Twenty months ago it was noticed that his abdomen was large and swollen. This swelling had since then constantly increased, until now it was the most marked feature of his anatomy.

Although he was pale and debilitated, his mucous membranes, nevertheless, retained their pink hue and showed none of that pallor characteristic of some kinds of leukæmia. His appetite had during the whole period been good, but the distress from tension after eating prevented him from fully gratifying it. His bowels were regular and his evacuations normal in consistency and color. He had had many attacks of nose-bleed, but not of any intractable character. His breath was short and respirations quick, but he was able to be around on his feet.

On examination I found a child in the highest degree ema-

ciated. His lungs, except for the compression to which they were subjected, exhibited no abnormal symptoms. There was an anæmic cardiac murmur, and his pulse was over 100 in the minute and rather feeble, but not intermittent. His temperature was 100° F. His urine had a specific gravity of 1020, and combined neither sugar, albumen, casts, nor crystals. His tongue and throat were normal in appearance and of a pink hue. There were no marked lymphatic enlargements in the neck, axilla, or growths, although a few small glands could be felt just above the clavicle. His feet were somewhat swollen and œdematous. The most marked objective feature was the abdominal distention. Excepting in the right and left lumbar regions it was impossible anywhere in the abdomen to discover any intestines. An enormous liver crowded them down from above, and an equally large spleen, extending from the left kidney into the right iliac fossa, forced them into the pelvis. The spleen lying diagonally across the abdomen exhibited the usual notched edges. The kidneys could not be detected. Notwithstanding the great size of the spleen, I was able to detect a certain mobility as I pressed it up and down or from one to the other side, and was encouraged to believe that it was comparatively free from adhesions.

Dr. Ives made a careful examination of the blood, and reported as follows: "Hæmoglobin, 46 per cent.; erythrocytes, 2,070,000; leucocytes, 336,000. The erythrocytes showed a marked poikilocytosis and hæmoglobinæmia degeneration. There were among them some that were enucleated. In the normal-sized monolocular leucocytes the body of the cell was slightly stained with eosin. There were also many giant-celled leucocytes, whose large single nucleus did not stain deeply with hæmotoxylon, the body of these not taking the eosin stain at all. The bodies of the polynuclear leucocytes took the eosin stain slightly."

There could be no doubt of the diagnosis. The only question for consideration was that of treatment. That which decided me to operate was the fact that the distress which he suffered seemed due chiefly to the abdominal distention. If that could be relieved the child might live the remainder of his life in tolerable comfort.

He entered St. Mary's Hospital on June 4, 1901, at 9 A.M.; temperature was 99° F., his pulse 124; at 4.30 P.M. his temperature was 100.6° F., pulse 104; at 7 P.M. temperature 100.8°, pulse 100.

June 5, 7 A.M. Temperature, 98°; pulse, 120. 4 P.M., temperature, 101.4°; pulse, 120. Thursday, 7 A.M., temperature, 98.4°; pulse, 116. 4 P.M., temperature, 100°; pulse, 132. Friday, 7 A.M., temperature, 99.2°; pulse, 112. At 10 A.M. on Friday the operation was performed. During the three days of his hospital life prior to the operation he was put on strychnine and quinine, and was given nourishing food and nutrient enemata. As soon as he was under the anæsthetic, one and a half pints of normal salt solution were injected under the integument of both axillæ, and after the operation was completed an additional half-pint was thrown into the groins.

An incision eight inches in length was made a little to the left of the median line, through the thin abdominal walls, whose thickness was hardly that of a thick sheet of blotting-paper. There was almost no oozing from the incision. The spleen was found to be absolutely free from adhesions, and was easily lifted out of the abdomen. Its veins and arteries were tied separately and cut between two ligatures, and the whole operation was completed without the loss of an ounce of blood. I found, on hasty examination, the liver enormously enlarged. There was a cluster of enlarged lymphatic glands in the pedicle. The left kidney seemed to be of normal size. The right kidney was not examined. There was no gross evidence of pancreatic change. The pulse and respiration of the child at the close of the operation were as favorable as at the beginning, and I was very hopeful of the result. Immediately on severing the pedicle the spleen was taken by my assistant and portions of it inoculated, while warm and living, into the abdomens of three guinea-pigs.

At noon when I called the boy was sleeping quietly and breathing easily. His pulse was 130. At 1.30 P.M., temperature, 99.6° F.; pulse, 136. At 4 P.M., temperature, 103.4°; pulse, 128.

He was evidently failing, notwithstanding the saline injections and hypodermics of strychnine and digitalin. At 5.30 P.M. he died. Examination showed the dressings slightly stained with blood, but no evidence of serious hæmorrhage. A post-mortem could not be obtained.

The inoculation of the spleen's blood and substance into the guinea-pigs was made to test Löwit's theory as to the *rôle* played by contagion in producing leukæmia. From among

the animals kindly placed by Parke, Davis & Co. at my disposal, three were chosen that were, to all appearances, in perfect health. They were carefully washed and made aseptic, and their abdomens were shaved. Within three minutes after the spleen had been severed from the body my assistants had inoculated the animals, one by injection of the warm blood into the peritoneal cavity, and the others by inserting slices of the cut spleen. The animals were kept many months under observation. They showed no reaction whatever to the operations. The wounds all healed by first intention. At the end of two months one of the guinea-pigs began to show signs of an enlargement of the neck, which did not, however, seem to impair his general health and vigor. At the end of the fourth month he was killed and examined. His blood, compared with that of healthy animals of his own race, showed no variation from the normal. The enlargement in the neck was a cheesy cyst, very common in these animals. The liver, spleen, pancreas, and kidneys were normal. It was not until nine months after the inoculation that the other two were killed. They were found to be in every respect perfectly healthy.

These experiments had only negative results, and have no other significance than is thus expressed. They were made with the utmost care to secure the most favorable conditions for the growth and development of infectious germs, if such existed. The asepsis was perfect, and the inoculated material living when it was inserted. If Löwit's protozoa exist in the leukæmic spleen, guinea-pigs must possess an immunity to infection by them. It might have been well to vary the experiment by inoculating animals of various species, and also by inserting the morbid tissue into the bone-marrow, or even injecting the blood into the spleen itself.

The pathology of leukæmia in its various forms is as yet so obscure that a rational therapeutics is out of the question. Whatever we do for its cure must be done empirically. We do not know whether the lymphatic or lienomedullary forms are variations of one morbid process or are distinct diseases, nor whether the trouble begins in the bone-marrow, or spleen,

or liver, or blood. While the preponderance of evidence is in favor of the bone-marrow as the original pathological focus, this is by no means so positively established as to be beyond question. None of the operative measures hitherto adopted can be said to decide the question as to the effect which the elimination of the spleen would have on the progress of the disease, for the reason that there has not, to my knowledge, been any removal of that organ in the early stages of the disorder.

While I have not been able to obtain histories of all cases of splenectomy for leukæmia, yet I have little doubt that nearly, if not quite, all have been undertaken after the spleen had reached a large size and had become a distressing complication of an advanced disease. Thus in von Burckhard's three cases the weights of the extirpated organs were respectively five kilos, two kilos, and three kilos. In Richardson's case the spleen weighed two and a quarter kilos, in mine two and a half kilos. That, under these circumstances, with advanced degenerative changes in the blood, liver, spleen, and other tissues, the mortality of the operations should be appalling is not surprising. Nor should we expect that, even though the spleen were the original seat of morbid action, its excision would alter the result, if postponed, until these changes had taken place. It seems to me, therefore, that if we would come to positive conclusions as to the *rôle* played by this organ in the etiology of leukæmia our next step must be to eliminate it from the field early in the disease. If it could be excised while the patient is still in comparatively good strength, and when it first shows evidence of enlargement, we might draw rational conclusions as to its influence upon the course of the disorder.

Excision of the spleen in leukæmia has hitherto been done for the relief of the abdominal distention with its consequent distressing symptoms. It might possibly, with greater experience, be done early in the disorder as a curative measure. At any rate, we cannot feel safe in making statements as to the relations of the spleen to the other organs affected by the disease until we shall have pursued the course suggested above

and carefully watched its effects. We should then be able to determine positively whether splenectomy in leukæmia works to the good of the organism or to the detriment. If to the latter, then the operation should be prohibited; if to the former, then our efforts should be directed to lessening its now excessive dangers. If the elimination of the spleen from the problem should prove that the presence of that organ had no influence whatever upon the course of the disease, we might still be justified in removing it early in order to prevent the disturbance due to its size and pressure, if only the operation could be made reasonably safe.

A problem which ought to be studied in these cases is the tendency of the enlarged spleen to become adherent to the surrounding structures. The most frequent cause of death after splenectomy for leukæmia has been the hæmorrhage due to ruptured adhesions. We may hardly assume that the great size of the organ is alone responsible for this tendency to agglutination, the more especially as in some cases like my own, in which the greatly hypertrophied organ had become crowded in to an extreme degree, adhesions have not been formed. Neither, in the absence of all history of injury, may we ascribe this tendency to hurts. The fever which accompanies the degenerative change may possibly predispose to irritative processes on the splenic surface. Whatever the cause may be, there can be no doubt of the fact that adhesions between the organ and the diaphragm, liver, and abdominal wall in leukæmia are the most serious obstacles to successful surgery. For this reason, operations, if undertaken at all, should be done at the very earliest possible period, when the enlargement of the spleen has just begun to make itself manifest. At this period it is not probable that any strong adhesions would have formed; the patient would be otherwise in much better condition, and the necessity of large incisions would not exist. Instead of a very severe operation on a much reduced patient, there would be a comparatively slight operation on a person who had not yet lost his powers of resistance. The history of all other great intra-abdominal operations teaches us

that the danger is in exact ratio to the previous duration of the disease. There is every reason to believe that this history would be repeated in operations on the leukæmic spleen if it should become the rule to operate at the earliest possible period. A series of successful operations at this period could not fail to throw great light on the pathology of leukæmia. It might, indeed, very materially change our ideas as to the relative influence in the etiology of the disorder of the spleen and bone-marrow. I cannot but feel that we shall not have done our full duty in the study of this disease until we shall have altered our practice in respect to the time of operating. In a disease almost uniformly fatal, we are certainly justified in pursuing any course which may offer a hope of therapeutic success. The value of operative procedures in an early stage of the disorder has never been put to the test.

In my own operation I was agreeably surprised by the almost total absence of hæmorrhage. It is highly probable that in very early operation skilfully done, this source of danger would be almost entirely eliminated. The weight of a normal spleen in an adult varies from five to twelve ounces. If we operated when it had no more than doubled its normal size, we could remove it through a short incision in a few minutes' time. There would follow no such shock as comes from the sudden relief of great tension and pressure, and we may believe that recovery would be rapid and sure.

To be able to operate early we must, however, get our cases early, and to that end we have to appeal to the general practitioner, who alone sees these patients in the beginning of their disease. As the diagnosis depends, then, on the examination of the blood, we should preach everywhere the necessity of such examinations as routine procedure in all cases of wasting disease. The progress of medicine depends no little on the competency of the great mass of the profession, and the study of the early stages of all diseases must always be the great privilege, as well as duty, of the practising physician, who alone has the opportunity to treat them in their beginnings.